REMARKS

The following remarks are prepared in response to the Office Action of June 20, 2006. Claims 1-18 remain pending in this application, after entry of this amendment. Claims 1, 5 and 11 are amended herein. Reconsideration in light of the amendments and remarks made herein is respectfully requested.

The present invention relates to a photoresist spray coating process for deep trenched substrates. According to one embodiment of the invention, the substrate surface is primed with a primer having a water contact angle between forty and fifty degrees [para. 0030]. A spray nozzle is moved across the diameter of the substrate at varying speeds to achieve a coat of substantially the same thickness throughout [para. 0023]. The photoresist is spray coated on the substrate surface at an angle to the substrate surface to obtain coverage of deep etched features [para. 0021].

The Office Action contends that Claims 1-3, 5-7, 9-10 are anticipated by *Raguin* (U.S. Patent Appl. No. 2002/0182547).

Applicant respectfully traverses this contention.

The *Raguin* reference is primarily concerned with fabricating a structure on a substrate with a low contrast photoresist having a height greater than or equal to 15 microns. The *Raguin* reference identifies different methods for applying the photoresist material on the substrate. FIG. 4 shows the photoresist material spin-coated on the substrate [para. 0035]. "In the dispense stage, photoresist 44 is applied using a spray, a pipette 45, or any other means of placing a puddle of the photosensitive material onto the substrate surface" [para. 0035] FIG. 6E shows the photoresist material coated onto a plano substrate using a spray method [para. 0053]. The photoresist is sprayed onto the substrate as the substrate traverses forward [para. 0053]. The

spray nozzle translates in a motion perpendicular to the plano substrate translation axis [para. 0053].

Independent claim 1 may be characterized by:

[A] rotating a substrate at a predefined speed, the substrate having a first surface;

[B] spray coating the first surface of the substrate with a negative-tone photoresist-solvent solution at an angle to the first surface to obtain coverage of deep etched features, the negative-tone photoresist to solvent ratio being in the range of one to three and one to five and a half and having a viscosity of between one and three centipoises; and

[C] moving a spray nozzle across the diameter of the first surface of the substrate at varying speeds to achieve a negative-tone photoresist coat of substantially the same thickness throughout the first surface.

According to claim 1 of the present invention, the substrate is rotated in [A] at a predefined speed and spray coated in [B] at an angle to the surface. The spray nozzle is moved in [C] across the diameter of the substrate at varying speeds. The photoresist to solvent ratio is in the range of one to three and one to five and a half and having a viscosity between one and three centipoises.

Claim 1 of the present invention is distinguishable from the *Raguin* reference for several reasons. First, while the *Raguin* reference discloses a spin-coating method, it fails to disclose, teach or suggest a spray coating process for deep trenched substrates. The present invention uniformly covers the substrate and its deep etched features by spray coating the photoresist at an angle to prevent photoresist buildup in the deep etched features of the substrate. In contrast, the *Raguin* reference teaches of dispensing the photoresist material by any "means of placing a puddle of the photosensitive material onto the substrate surface" [para. 0035]. This placement

of the photoresist puddle would likely cover any shallow trenches, deep trenches, deep vias, and/or through-etched vias formed in the substrate.

Second, the *Raguin* reference fails to disclose, teach or suggest moving a spray nozzle across the diameter of the rotating substrate. The spray nozzle of the present invention moves across the diameter of the rotating substrate. In contrast, FIG. 6E of the *Raguin* reference shows a plano substrate that moves forward as a spray nozzle translates in a motion perpendicular to its translation axis. The *Raguin* reference does not disclose, teach or suggest that the spray nozzle moves across the rotating substrate of FIG. 4. Rather, the *Raguin* reference only teaches that the photoresist material is simply applied on the rotating substrate of FIG. 4.

Third, the *Raguin* reference fails to disclose, teach or suggest moving the spray nozzle at varying speeds across the diameter of the rotating substrate. According to the present invention, the nozzle moves across the diameter of the substrate at varying speeds such that the nozzle travels quicker at the center and slower at the edges of the substrate [paras. 0023-24]. This is done to achieve uniformity in the thickness of the photoresist across the entire substrate and avoid excessive photoresist buildup around the center of the substrate [paras. 0023]. In contrast, the *Raguin* reference does not disclose, teach or suggest that the speed of the spray nozzle varies across the substrate. In FIG. 6E of the *Raguin* reference, the spray nozzle translates across the substrate as the substrate moves forward. In order to achieve a uniform photoresist thickness, the spray nozzle in the *Raguin* reference must move at a constant speed to allow an equal coating of the photoresist material over the substrate.

Finally, the *Raguin* reference fails to disclose, teach or suggest the photoresist to solvent ratio being in the range of one to three and one to five and a half and having a viscosity of between one and three centipoises. In fact, the word "ratio" was never used in the *Raguin*

reference. Furthermore, the *Raguin* reference does not disclose, teach or suggest the viscosity range recited in claim 1. Accordingly, Applicant respectfully requests that the rejection be withdrawn.

Claims 2-3 depend from Claim 1. Thus, these claims are patentably distinct from the *Raguin* reference for the same reasons advanced above with respect to Claim 1. Moreover, independent Claim 5, and its dependent claims 6-10, are also patentably distinct from the *Raguin* reference for the same reasons advanced above with respect to Claim 1.

The Office Action further rejected Claims 11, 13-18 as being obvious over a combination of *Raguin* in view of *Research Disclosure* (Kenneth Mason Publications, vol. 324, April 1991) (referred to herein as "*RD91*"). We have already demonstrated the inadequacies of teaching the present invention in the *Raguin* disclosure and under 35 U.S.C. §103, it would be incumbent upon the teaching in the *RD91*reference to provide a teaching reference for supplementing the deficiencies of the *RD91*disclosure.

It should be noted that the burden of establishing a *prima facie* case of obviousness lies with the Patent Office. *In re Fine*, 5 USPQ2d 1596 (Fed. Cir. 1988) (stating: "The PTO has the burden under section 103 to establish a *prima facie* case of obviousness"). To establish a *prima facie* case of obviousness, (1) there must be some suggestion or motivation (either in the references themselves or in the knowledge generally available to one of ordinary skill in the art) to combine the reference teachings; (2) there must be a reasonable expectation of success; and (3) the prior art reference must teach or suggest all the claim limitations. See *MPEP* §§ 2142-43.

It is presumed that the *RD91* reference is cited simply for the teaching of immersion in a fluid followed by thorough rinsing and drying. The *RD91* reference teaches the cleaning of a stainless steel and copper laminate surface prior to the application of a dry film photoresist. The

RD91 reference does not provide any suggestion or motivation that the preparation of a stainless steel surface is the same as or similar to the preparation of a substrate wafer.

A person skilled in the art would not employ the preparation techniques of a stainless steel metal for a substrate wafer. The substrate wafer has different structural and chemical characteristics from stainless steel. The stainless steel metal requires oxalic acid cleaning to remove any brown streaks formed on the surface of the stainless steel. *See Corrosion of Stainless Steel Handrail caused by Fabrication Process*, Corrosion Testing Labs., Inc., page 4, http://www.corrosionlab.com/Failure-Analysis-Studies/29073.corrosion.304ss-handrail.htm. The oxalic acid is a cleaning agent and not a primer, as contended in the Office Action.

According to claim 11, the method for coating photoresist on a substrate having deep features includes "priming the substrate by immersing it into a priming solution, the priming solution having a water contact angle of between forty and fifty degrees." Neither the *Raguin* reference nor the *RD91* reference disclose, teach or suggest priming the substrate. In fact, the word "priming" or "primer" was never used in either reference. Furthermore, the *Raguin* reference and the *RD91* reference fail to disclose, teach or suggest a water contact angle of between forty and fifty degrees. Hence, the *RD91* reference does not satisfy the deficiencies of the *Raguin* reference.

Claims 12-18 depend from Claim 11. Thus, these claims are patentably distinct from the combined references for the same reasons advanced above with respect to Claim 11.

Applicant accordingly submits that the present invention is more than adequately distinguished over any combination of the references of record by the presently pending claims, and is worthy of patent protection.

In light of the above amendment and remarks, applicant respectfully submits that all the claims are now in condition for allowance and respectfully requests that this application be passed to issue.

I hereby certify that this correspondence is being deposited with the United States Postal Service as First Class Mail in an envelope addressed to Mail Stop Amendment, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on September 19, 2006.

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Signature

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Very truly yours,

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